AARES 54th Annual Conference 2010

agri benchmark:
Benchmarking Beef Farming Systems Worldwide

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Abstract

The *agri benchmark* Beef Network is a unique association of economists, scientists, farmers and advisors, as well as scientific and agribusiness partners from more than 30 organisations across 23 countries. The Network benchmarks 'typical' beef finishing and cow-calf farms from participating countries, which are generated from panel meetings of farmers and advisors and collated using a standard operating procedure. Once data are entered and processed using a series of Excel spreadsheet tools, it is broken down to the enterprise and animal level for performing unit cost analyses. The complexity of the data recorded enables detailed analyses and international comparisons on farm demographics (land size, stocking numbers, daily weight gain, prices), cost breakdowns by composition and per 100 kg carcass weight, physical and economic labour productivity (kg beef per hour, return per unit of labour cost), land productivity (carcass weight per hectare), short and medium term profitability (per 100 kg carcass weight) and whole farm profitability ($AUD '000). This paper discusses the approach and benefits of the *agri benchmark* model and network and presents key findings and results from the 2009 partner countries, as well as new developments, including sheep and emission analyses, from the *agri benchmark* Beef Network.

1 Background and questions

Globalisation of economies and liberalisation of trade and their economic, environmental and social implications are major driving factors of farm development. Stakeholders in agricultural supply chains want answers to the following questions surrounding farms:

1. How is beef (milk, grain, oilseed, …) produced and why?
2. What are the reasons for differences in economic performance?
3. How did the beef (milk, grain, oilseed, …) production in different countries develop and why?
4. What will farms do with further changes in framework conditions?
5. Where will beef (milk, grain, oilseed, …) be produced in the future?

To answer these questions on a global scale, a data and information system is required that allows comparative, cross-country farm analysis. The system should also allow the analysis of future changes in the policy and market framework conditions on farms. The options were to a) use an existing system or b) create a new one.

2 'System requirements'

'You can only assess, change and improve what you measure' is the underlying principle of approaching the questions above. Thus, addressing the data issue was the first step. The following data requirements were identified as crucial for the type of analysis required:

Participation of producers and advisors

to maintain the economist's connection to the 'real world' and to cross-check (intermediate) results to the practitioners.

Production system approach

to obtain the physical data basis (quantities) required for explanation of differences in economic performance and to allow productivity analysis.

Harmonised methods for data collection and calculation

to assure the comparability of the results.

Whole farm data instead of just enterprise data
to reflect the interactions between enterprises and to allow a total cost analysis.

Up-to-date data
to be able to give timely answers to today's questions.

Low cost of data collection and maintenance
to assure the exercise can be easily started and sustainably continued over time.

Easy accessibility of data
to avoid delays in data generation.

In the first step, existing data sets were used and tested in PHD studies (Isermeyer, 1988; Deblitz, 1993). Examples are national data sets like the USDA-ERS cost of production, ABARE, New Zealand Meat and Wool Economic Service as well as multinational data sets like the EU Farm Accountancy Data Network FADN. It was found that all of these sources lacked at least one of the criteria listed above. Further, harmonising the different data sets required unreasonable amounts of time and resources, were often based on assumptions and did not overcome uncertainty and errors. Based on these experiences the decision was made to create an **own data set**.

Collecting data in various countries around the world once might have been feasible but maintaining them with reasonable effort is impossible without the help of colleagues from the countries analysed. It became clear that the only way of managing the data was to establish a **network** of research institutions and associated economists. The advantages are:

- Language problems can be overcome.
- Local academic and professional knowledge and expertise can be made available.
- Local contacts to farmers and advisors can be easily facilitated.
- The workload between the research partners can be shared.
- Local support and funding can be addressed.

Following these considerations, in 1997, the International Farm Comparison Network (IFCN) was founded. In 2006, the beef and cash crop branches of IFCN were transferred into the *agri benchmark* Network. In the beginning of 2010, the agri benchmark branches cover the Beef and Cow-calf Network as well as a Cash Crop Network (grains, oilseed, bio-energy). Dairy production is covered in an associated network called European Dairy farmers (EDF). Within *agri benchmark*, expansion to sheep is on the way and expansion to pig and horticulture is in planning (see Section 8 of this paper).

In the following, reference is mainly made to the Beef and Cow-calf Network. The Cash Crop Network is mentioned where necessary.

3 *agri benchmark* and its goals

agri benchmark is a global network of farm economists generating sustainable, comparable, quantified information about farming systems, their economics, their framework conditions and perspectives world-wide.

The main **goals** of this project are:

- Establish a sustainable cooperation between farm economists and farmers in the participating countries.
- Develop powerful tools for a worldwide analysis of agricultural branches.
- Compare typical farms (production systems, production costs, competitiveness, future development).

– Understand the impact of the major driving forces on agricultural branches.
– Provide relevant information for all clients who want to strengthen their position in a global agricultural economy.

agri benchmark can rely on more than 20 years of experience in international benchmarking of farms.

4 Benefits and outputs

The project generates a variety of benefits and outputs. Specific products generated every year are:

– Farm-level result data bases for beef, cow-calf and cash crop with more than 300 variables each and many additional features (standard and individual charts, currency converter, language converter, unit-converter, farm rankings)
– Models for farm, cost, policy and strategy analysis
– Training in benchmarking and application of models/tools
– Tools for further analysis of the result data base (benchmarking tool, time series tools)
– Tools for beef trade analysis (based on UNComtrade database)
– Time series data for beef and livestock prices
– Annual Conferences (Beef, Cash Crop)
– Annual Reports (20 hardcopies, PDF on website)
– Country presentations about the beef sectors of participating countries
– Presentations about key production systems in various countries
– World map presentations with key global findings
– Access to member section of the website
– Your own publications using the data (based on network rules)

What *agri benchmark* partners say

"I think [the Beef Conference] is, as always, a unique opportunity to share information, methodologies and conceptual issues related with beef production and economics in a world wide sense."

"… the information I took away from the conference was immense. It has certainly improved my knowledge on just how my country sits in comparison to our competitors, and has really given me an insight into the pressures of farming in other regions … which are so different from our own country."

"I want to express my satisfaction about the training and the conference. It was not only a professionally most interesting experience but a very enjoyable week thanks to all of you."

"This conference has extended my experience and information has been useful for me as an agricultural economist and for my own research centre."

"It was a very interesting and enjoyable week and I'm already looking forward to next year's conference. I look forward to working with you all in the future."

"The conference is an opportunity to find an understanding of farmers in different production environment and to pass the information to farmers in our country. It is a unique board to discuss strategies, competitiveness and perspectives of beef production worldwide. Thanks to all because it was the professional knowledge of all participants and a wonderful hospitality of our hosts which made the conference great."

"I was most impressed by the open and frank discussions at the workshop, conference and on the farms and with the professionalism, dedication and camaraderie of the group."

"Thank you to you and your team once again for all the effort to make this whole program such a great initiative. It is the leadership provided [from the coordination centre] that make the country teams perform according to set standards."

"My experience as a first time attendee was extremely positive and the contacts I have made will be very useful in the future. The vision of agri benchmark and the commitment to build this network to where it is today is very much appreciated."

"It is a great pleasure to meet you all there and it is extremely beneficial from my side to share your ideas about the global situation of the beef industry."

Examples for results are provided in section 7 of this paper. Further benefits and outputs are less easily quantifiable:

- *agri benchmark* is a low input, high output project – put one country in and get the world back.
- Participants see their country's farms in the world-wide comparison.
- Partners and customers benefit from the personal exchange and the farm-level and product expertise of colleagues from all around the world.
- *agri benchmark* is a workshop type of project and conference, working on an annual schedule, now with varying conference locations and field trips throughout the world.
- The annual conferences are an exchange of know-how in an atmosphere of open discussions of results.

5 Organisation and funding

agri benchmark has an experienced coordination centre that is commonly managed by two institutions: the Johann Heinrich von Thünen Institute, Germany (vTI) and the German Agricultural Society (DLG). vTI focuses on the scientific analysis as well as the coordination of the scientific partners, while DLG activates cooperation with agribusiness and conducts the technical and financial end of the project.

agri benchmark is a non-political and non-profit activity. Rules and values of the network are developed by mutual agreement. Methods and main results are exposed to an ongoing quality assurance process and are open for public discussion. *agri benchmark* is dependent on the support of various scientific and agribusiness institutions as well as private companies. Partners benefit from first-hand access to information and extra services.

The project works on an annual schedule with annual conferences in different parts of the world (one year Europe, one year out of Europe) and annual reports summarising the most important results.

'Put your country in and get the world back' is a major characteristic of *agri benchmark*. At present, 24 countries participate in the Beef Network, representing more than 80 percent of the world's beef production and exports.

The Networks can not be run without resources or with funding from just one source. At present, funding is based on three pillars:

1 *agri benchmark* Coordination Centre provides coordinating staff in kind plus some cash contributions. Further staff is hired using the resources generated from the other two pillars below.

2 Companies related to agribusiness as well as international and national institutions are invited to participate and financially contribute to the project. This part of funding is presently more prevalent in the Cash Crop Network than in the Beef Network.

3 A Consortium Fee for the services provided by the Coordination Centre is in place. This instrument is presently more prevalent in the Beef Network. Depending on the partners' abilities and preferences, flexible solutions are provided.

6 Methods

Benchmarking in the *agri benchmark* networks is understood as comparative analysis rather than prescriptive advice. The major methodological (and organisational) achievement of *agri benchmark* is probably to set standards, make them transparent and apply them on international level. This refers to a) the data collection, b) the data processing, particularly cost allocation / assignment for cost per unit analysis and c) the presentation formats for results.

6.1 Enterprises and products analysed

The analysis considers cow-calf (suckler-cows) and beef finishing enterprises separately. An additional tool allows the merging of both enterprises to analyse the detailed cost and returns structure from birth to slaughter in integrated farms (running both enterprises finishing own weaners) and in combined enterprises where the weaners are produced in one farm and the finishing is done in another farm. This allows the analysis of cattle production chains between regions and countries.

The fact that *agri benchmark* mainly focuses on final products (beef) that are being traded raises the question why cow-calf enterprises are analysed which are mainly producing an intermediate product: a weaner which is typically not traded cross-country. There are several good reasons to include cow-calf in the analysis:

1. Weaner calves are usually 7-11 months old when they are sold. We would miss detailed cost information about a good part of their lives not analysing this period.
2. The information obtained can be used to analyse the economics of cow-calf production between regions where trade of weaners exists. An example is the very well-established export of weaner calves from France to Spain and Italy as well as from Mexico to the United States.
3. In some cases, cow-calf even produces the final product, a slaughter calf. Examples are Spain and Austria.

In the future, the analysis shall be extended to backgrounding / store cattle which in some countries form an integral part of the supply chain (USA, Australia).

The **cow-calf** enterprise starts with the birth of the calf and ends with the day of weaning. The output of the cow-calf enterprise is measured in total live weight sold and comprises weaner calves, cull animals and breeding animals.

The **beef finishing** enterprise (also called finishing enterprise) starts

- when dairy or weaner calves or feeder cattle (backgrounder, stores) are bought from out-side the farm,
- when dairy or weaner calves or adult animals are transferred from the dairy or cow-calf enterprise to the beef finishing enterprise in the same farm.

The output of the beef finishing enterprise is measured in carcass weight sold and comprises all animals which are exclusively reared for slaughter: bulls, steers, heifers, calves or cows. It does not include cull animals from a dairy or a cow-calf enterprise on the same farm.

The following types of animals are compared:

- Animals finished for meat export, animals which can potentially be exported in the future or animals from which the meat is a domestic substitute for beef imports from other countries.
- Final products, i.e., finished animals that go to slaughter (not backgrounders).

– Heavy male animals (bulls or steers), as these categories can be better compared than males with females or even with calves.

In the future, with more farms and more production systems, subgroups could be formed for a comparison of specific meat products like heifer meat.

6.2 Typical farm approach

The *agri benchmark* farm data sets are generated using the typical farm approach. This approach generates data sets that are supposed to reflect the prevalence of certain indicators in different regions selected. A typical farm is defined as:

– an existing farm or a data set describing a farm,
– in a specific region which represents a major share of output for the product considered,
– running the prevailing production system for the product considered,
– reflecting the prevailing combination of enterprises as well as land and capital resources,
– as well as the prevailing type of labour organisation.

The typical farm is a virtual farm that does not exist in reality but that comes very close to a large number of farms in the region identified. At the same time, a typical farm can not represent a whole country. This is why we try to always refer to the typical farms in a region and not to the country.

Characteristics	Individual farm data	Average farm data (surveys)	Typical farm data
Representativeness	–	+	+ / –
Consistency of data sets	+	–	+
Quantity structure	+	–	+
Data availability	+	+ / –	+
Up to date	+	–	+
Feasibility data collection	+	–	+
Data confidentiality	–	+	+
Cost data collection	+ / –	+ / –	+

+ = Strength of the sample method

– = Weakness of the sample method

Figure 1: Strength and weaknesses of different farm data sampling methods

Figure 1 shows three main sampling methods for farm data:

– Individual farm data (like European Dairy Farmers)
– Averages of farm survey data (like the Farm Accountancy Data Network of the EU (FADN))
– Typical farm data (like *agri benchmark*)

Each of them has particular strengths and weaknesses. It is obvious that the typical farm approach is the one with the most advantages when considering the criteria applied here (which are basically the criteria valid for *agri benchmark*).

Representativeness can become an issue with the typical farm approach. To address this issue, it must be clarified **what** should be represented by the data. As *agri benchmark* does international comparisons of products traded between countries, the main focus is representing the majority of

production rather than the majority of farms. These issues are addressed in the 'Standard Operating Procedure to define typical farms'.

The Standard operating Procedure (SOP) to define typical farms

For the purpose of defining typical farms, a standard operating procedure was developed to ensure the same approach and working steps in all countries participating (Deblitz, Zimmer, 2005).

The steps to define typical farms are defined as follows and specified in the papers:

I. Identification phase (scientist + advisor)
- Go strictly branch-wise (e.g. beef, cash crop etc.)
- Select important regions (measured by cattle inventories and densities)
- Analyse regional farm size structure
- Define features of two or three typical farms (production system, production factors)
- Crosscheck with population and/or survey data

II. Data collection phase (scientist, advisor, farmers)
- Contact farmers who operate such farms (»panel«)
- Collect full set of economic and physical farm data in a group meeting (consensus)

III. Processing and crosschecking phase
- Compute results for the virtual typical farms
- Cross-check with advisor (farmers); make improvements

Step I is the most important for assuring the highest possibly degree of representativeness of the typical farms defined. The accuracy of this step depends on the availability of regional statistics – mainly cattle numbers broken down by different categories. The indicator for cow-calf is the number of suckler-cows and the indicator for beef finishing is 'cattle on feed'. If these are not available, we use different approximations. For example, 'total cattle' can be used as an indicator for both cow-calf and beef production in a country where milk production is of minor importance and cow-calf and beef finishing is typically done in the same farms.

agri benchmark relies on existing farm networks in participating countries, such as the representative farm network of 98 farms of Texas A&M University (Richardson et al., 2009), the network of more than 450 existing farms which are converted into numerous case studies (cas-types) from the French Livestock institute (Sarzeaud et al., 2009) and the farm network of beef farms in Northern Italy operated by the CRPA (de Roest, Montanari, 2006).

On the other hand, a number of national networks emerged using *agri benchmark* methods, models and expertise. Examples are Spain, Sweden, South Africa, Indonesia and a presently small network in Australia. All these networks receive continuous support from the *agri benchmark* Centre and at the same time are returning their data and regional experience into the international exercise.

Size and management level of the typical farms

Size is defined as 'total animals sold per year' for beef finishing and 'average number of suckler cows' for cow-calf. The following criteria for the definition of the farms apply:

- The typical farms should have less than 50 % off-farm income and/or sustain at least the living of one person.

– As a standard, *agri benchmark* defines a moderate size and a large size farm in each region identified. This allows reflecting a large number of farms and a major share in production.
– Both farms should represent an average level of management (average profit level).
– Regional statistics on farm size distribution are used to determine the position of the farms in the distribution of the farm population or representative surveys.

In order to reflect the region's potential further to the two farms it is envisaged to define a third, large farm with top management in the future. Top management is defined as the top 10 % farms with respect to economic success which again is defined by farm profit (preferred), otherwise gross margin or physical productivity, if profit data are not available.

6.3 Data management and cost calculations

All data collected are submitted to the *agri benchmark* Centre where a central data processing, cross-checking and feedback to the partners is performed in a multi-step, annual procedure. The data remain ownership of the research partners providing them, and the partners authorise the Centre to process and use the data for reporting and the benefit of the Network's development.

Per unit output calculations

Most of the *agri benchmark* enterprise calculations are presented on a per unit basis. In beef production these are:

Beef finishing: 100 kg carcass weight sold. This reflects the dressing percentage/carcass yield. Alternatively, results can be referred to live weight.

Cow-calf: 100 kg live weight sold. The sale products of a cow-calf enterprise are a mix of live animals (mainly weaners, sometimes breeding cattle) and cull animals (cull cows, cull heifers). The carcass weight of the weaners and breeding cattle are not relevant, however, the sales of all animal categories are relevant for the economic performance, output is measured in total live weight sold, including all categories mentioned above.

Merged figures of beef finishing and cow-calf: 100 kg carcass weight sold.

However, with the tools it is possible to select any other reference unit for the results, for example per ha, per animal, per enterprise and other.

The reasons for a per-unit analysis are:

– Kilograms of beef and tons of cash crops are finally traded internationally, i.e., not the land (ha) nor the entire animals.
– Given the wide variety of production systems and their different productivity levels per animal and per ha, it appears the only way to make cost and returns comparable.

Allocation / assignment

As farm data are collected on whole-farm level, a major task for enterprise and per-unit output analysis is to allocate/assign costs (and returns) in two steps:

1. Whole-farm level overhead costs, depreciation and maintenance for machines, buildings and equipment, interest for loans, labour cost and whole-farm returns must be allocated to the enterprises (for example cash crop, beef finishing, and cow-calf).

2. The costs and whole-farm returns which were allocated/assigned to the enterprise are further allocated to single crops (for example forage crops) or to groups of animals (finishing groups, calving periods) which usually have different resource and input requirements within the enterprises.

In the **beef finishing** enterprise, costs and returns 'arriving' from whole-farm level can be allocated to up to five different finishing groups, which can be characterised by different sex (for example bulls, steers, heifers), performance indicators, feed rations and purchase and sale prices. Allocation from enterprise level to the groups can be done on a per head, return share or weight basis.

In the **cow-calf** enterprise, costs and returns can be allocated to two different mobs (groups) of cows which are typically characterised by different breeds (for example purebred vs. cross cattle) or calving periods (for example spring and winter calving) and associated differences in performance and price indicators. Allocation between groups can be done on a per head, return share or weight basis.

Before making a choice for a certain method to allocate costs and returns the following questions should be answered:

- How relevant are different methods for the results?
- What is the most appropriate method?
- What is the most feasible method?
- What is the input/output ratio for the different methods?

The discussion about these questions is ongoing. However, a lot of experience has been gained about the pros and cons of different methods over time. Based on this experience and the fact that we are talking about a world-wide scope of analysis, the Network agreed on the procedures outlined below.

1. As many cost positions as possible are treated as variable and output related. This means that their values change automatically with the changes in the size of the operation. Examples: Contractor costs for harvesting cereals or forage crops should not be specified as fixed costs on whole farm level but as variable costs per ha.
2. As many production factors (land use, labour and capital requirements) as possible are allocated to the enterprises during data input instead of being allocated from whole farm level later with one of the allocation factors described below.
3. All remaining overhead and whole-farm cost are allocated according to:
   - Their share in land used
   - Their share in labour/machinery hours
   - Their share in returns or in gross margins

The model and the cost analysis tools allow various options to handle the cost allocation – from manually inserted allocation factors to semi-automatic (based on enterprise codes for production factors) and a mixture of both. The semi-automatic cost allocation based on return shares is the method used for the majority of the farms.

6.4 Models and tools

The data collected in the panels are entered into the simulation model TIPI-CAL (Technology Impact and Policy Impact Calculations). The model allows the simulation of farms for up to ten years in the future

- in different regions and countries,
- with farms of different sizes and legal forms,
- under different policy, market and technology scenarios,
- and using different farm development and adjustment strategies.

In addition, a whole set of analytical tools for benchmarking (returns, cost and profitability), further data analysis as well as data and scenario management for policy and farm strategy analysis is available. Selected results obtained with the tools are presented in section 7 of this paper.

The characteristics of TIPI-CAL are the following:

- Excel-spreadsheet
- Shareware for partners (after training by *agri benchmark* staff)
- Dynamic-recursive calculation of cash-flow
- Deterministic or stochastic mode of operation
- Detailed price and quantity structure for the beef finishing, cow-calf, cash crop & forage production, dairy enterprise and sheep enterprise (ewe and lamb finishing)
- 10 years projection/simulation of the farm data for a) updating farm data from one year to the next and b) policy impact and farm strategy analysis
- The main model output is a profit and loss account, a balance sheet and a cash-flow statement

In addition to the standard model which is used to calculate the farm development over time and the benchmarking figures, a set of tools was developed, all of which using the Result Data Base (RDB):

Ranking tool: Ranks the farms in the sample by any chosen variable of the RDB in a table and a chart.

Time series tool: Shows the time series of presently up to 4 years for any chosen variable of the RDB and breaks down the economic indicators in an exchange rate and a national impact.

Benchmarking tool: Allows direct comparisons for any set of chosen variables of the RDB between individual, a number of farms and averages of farms.

Sensitivity tool: Allows the percentage variation of selected variables and shows their impact on selected key output variables.

Over time, a significant growth in size, complexity and data volume took place. A step-by-step reconstruction of the model into a SQLite open source data base system has commenced in 2009 and should be concluded in late 2011.

7 Key findings 2009

The key findings of the Beef Network are published in the *agri benchmark* Beef Report 2009 which can be ordered from the website at:
http://www.agribenchmark.org/beef_results_farm_beef_reports.html

In the following, a selection of results of the Beef Report and other findings from the Network are presented.

7.1 Cow-calf

Farms analysed

In the 2009 exercise, a total of 42 typical farms in the most important regions for cow-calf production in 20 countries were analysed. They represent farms and production systems that can make a living from cow-calf production and/or represent a high share of suckler-cows in their countries. The farm sizes vary from two to 1,100 suckler cows. With few exceptions, most of the farms combine the cow-calf production with other enterprises. The analysis year is 2008.

Impacts of price variations and crisis

Since the cow-calf enterprises are mainly grass-based systems, the impact of the price developments of feed and energy-related inputs, as well as the financial crisis, was slightly less and indirectly via the finishing enterprises.

An overall upward trend marked returns and costs, measured in US$, in the last years, including 2008 vs. 2007. The valuation of almost all currencies against the US$ (except Argentina, South Africa and the UK) is one reason. National price changes are the other component and were mostly upwards, too, adding to the exchange rate effect.

Weaner prices

Weaner prices are displayed per head and per 100 kg LW, the latter of which is better suited for comparisons between different countries and cattle weights. Prices range from US$ 100-150 per 100 kg LW in Argentina, Brazil and some farms in the Ukraine, Australia and South Africa, about US$ 200 in North America, Colombia, China and farms in Indonesia, Australia and South Africa, through to US$ 250-350 and higher in EU countries including Norway.

Market and government

Variations in total returns and costs are significant, ranging from around US$ 150 per 100 kg LW sold and less in farms in Argentina, Brazil, Australia and US$ 400 and well above in some European farms.

Government payments play an important part in most European countries and go up to 50 percent of the total returns, particularly in Austria, France, Spain, Norway and Czech Republic where suckler-cow premiums are still coupled.

An eye-catching result is that – despite the favourable exchange rate for the U.S. – there is hardly any cost difference between the North American farms and some of the lower cost European farms.

What is special about cow-calf?

Especially when compared with beef finishing, what special features of cow-calf might lead to less pronounced cost differences?

– Acknowledging existing differences, cow-calf production systems are more similar internationally than beef finishing systems.

- Animal purchase cost is not a major cost for cow-calf systems but it is in finishing systems.
- Cow-calf production is mostly located in marginal areas throughout the world, whereas finishing also exists in arable areas.
- Differences stem from different productivity levels which are mainly related to climate, land productivity, and breed.
- Land costs are on average much more important. The main reason is that land is – apart from labor – the main production factor for cow-calf and that cow-calf depends much less on purchased feed than beef finishing.

The analyses shows that factor costs in low cost farms are not necessarily less important than in high cost farms. The same holds true when comparing large farms with small farms. Further, family farms do not necessarily reveal higher factor costs than non-family farms.

Enterprise profits slightly down against 2007

21 out of 42 of the cow-calf enterprises are profitable medium term, i.e., showing a positive result of their profit and loss account. Long term profitability is achieved by eight of the farms, which are farms in France, Czech Republic, Brazil, Indonesia, Australia and South Africa. 10 farms can not even cover the cash costs with their returns.

However, when looking at the whole farm level of the farms, almost all of them are profitable. This means that either (decoupled) payments or other enterprises cover possible losses on the cow-calf side.

7.2 Beef finishing

Farms analysed

In the 2009 season, a total of 58 farms located in the most important regions for beef production in 22 countries were analysed. They represent farms and production systems that can make a living from beef production and/or represent a high share of beef production in their countries. The farm sizes vary from one to 75,000 finished animals sold per year. The analysis year is 2008.

Feed price impacts 2008 less than in 2007?

Cost increases can be observed with feed prices playing a key role (incorporating the impacts of increased energy prices, supply shortage and speculation). Their extent was, however, not as high as the price peaks in 2008 suggest (see Chapter 7.3 for detailed explanations) and the overall impact of the record high feed prices in 2008 could be contained and had already started to be seen in 2007.

Beef prices upwards, livestock prices mixed

Beef returns (prices) reach from less than US$ 200 per 100 kg CW in Argentina via US$ 200-300 in farms in Brazil, Australia, South Africa and Ukraine, US$ 300-400 in farms from Poland, North America, Colombia, Peru and Australia to more than US$ 400 per 100 kg CW in most of remaining European farms, China and Indonesia. Coupled direct government payments are only important in some farms in Sweden, Norway and the Ukraine anymore. With very few exceptions, the US$-prices showed a stable or upwards trend in the 4-year period 2005-2008 with a dip in some countries in 2007.

The price trend for livestock prices is upwards, too, but less homogeneous than that for beef prices – the overall variation between years seems to be higher and also the direction appears to change more frequently.

Cost levels rising but narrowing

Cost differences are even higher than differences in returns, reaching from more than US$ 1,000 per 100 kg CW in Austria and Norway to US$ 200-300 in South America and South Africa. Cost levels in Argentina and Brazil have gone up more than elsewhere, mainly narrowing the gap to the rest of the world. Cost levels in the high cost countries are about 2.5 times higher than in the low cost countries, down from 3-4 times in the past.

The statements about the different levels made for total costs can basically be extended to factor and non-factor costs, with huge variations in their composition. This also means that the share of factor costs (labour, land, capital) in total costs is similar and sometimes even higher in the low cost farms when compared to the rest of the farms.

40 percent unprofitable

With the turbulences of the last two years, beef finishing does not appear to be particularly profitable, with less than 20 percent of the enterprises profitable long term. However, enterprises from all continents representing all production systems are in this group.

Around 40 percent of the enterprises are profitable medium and short term. The remaining 40 percent of the enterprises are not even profitable short term. The whole farm profitability in most farms – driven by other enterprises and/or subsidies – might be a reason why they continue beef production despite losses in the finishing enterprise.

7.3 Specific selected findings for beef finishing

Beef finishing production systems

The network's economic analysis has always been based on a production system approach. This section represents the current results of the current production system **classification**. The classification is subject to change and amendments with new farms entering the comparison as well as changing price relations and feeding / management systems. The three main criteria for defining a system are:

1. **Dry matter feed percentage composition:** based on the feed ration information included in many of the data sets the percentage dry matter feed composition can be calculated.

2. **Management/housing system**: Keeping of the animals outside or in more or less confinement.

3. **Extent of purchase feed**: Proportion of purchased feed (from outside the farm) in the ration.

Additional attributes of the systems are a) the type of animals kept, b) the farm sizes and c) the main locations where they are found. These attributes were, however, not used for defining the systems.

Figure 2 provides an overview of the production systems defined. Each farm in the sample is assigned to one of the four production systems shown.

	Pasture	Silage	Feedlot	Cut & Carry
				
Feed % in dry matter	> 30% pasture	> 30% silage and other forages	> 50% grains and other energy feed	> 30% freshly cut grass & other vegetation
Management/ Housing System	Outdoor year round or part of the year	Closed or semi-open barns with slatted floors and/or straw bedding	Confined, large, open pens, partially with sun-covers	Mix of cut and grazing of paths and paddies
Extent of purchase feed	Low	Medium	High	Low
Type of animals	Mainly steers (and heifers)	Mainly bulls (and heifers)	Mainly steers (and heifers)	Mainly bulls (and heifers)
Main locations	Southern Hemisphere, Ireland, UK	Europe, China, increasingly South America	North America, Australia, Italy, Spain, increasingly South America	Asia and Africa
Farm sizes	Small to large	Medium	Large 1,000-50,000 head one time capacity	Small

Figure 2: Beef finishing production systems

Weight gains

Weight gain is one of the most important productivity indicators in beef finishing. Figure 3 shows two types of weight gain measures, with the farms sorted by the production systems introduced in Figure 2.

Non-surprisingly, average daily weight gain or **daily weight gain** (DWG) is highest in the feedlots, followed by the silage systems and pasture as well as cut and carry systems at the other end of the range. The feedlots achieve the high figures as a combination of a) high energy rations, b) short finishing periods, and c) sometimes compensatory gain if animals came from a backgrounding process on pasture.

The **net gain** shown in the yellow bars of the figure reflect the whole life of the animals as well as the carcass yield – and not just the finishing period. It can clearly be seen that the feedlots' superiority diminishes against the other production system and that now the silage systems appear to be at least equal in performance. This is particularly evident in those cases where a particularly low intensity grazing system proceeds the feedlot period, like in the cases in Brazil, Peru, Australia and South Africa. In contrast, the net gain values of (European) silage systems where animals are fed a relatively high energy ration for most of their life remain on a relatively higher level when compared with the DWG figures.

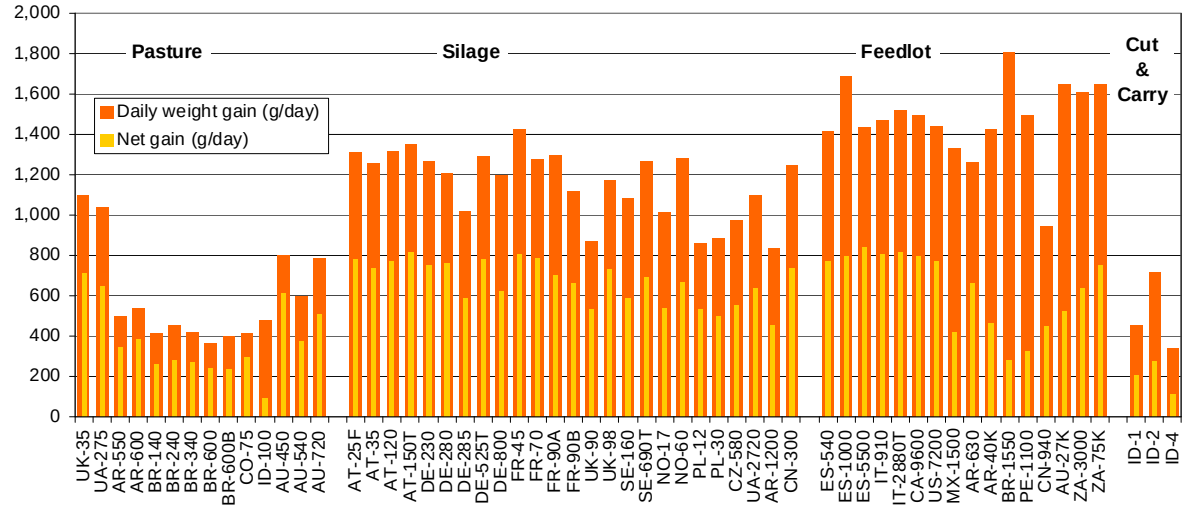

Figure 3: (Average) Daily weight gain (DWG) and net gain (g per day) by production system
DWG: (live weight at end – live weight at start) / finishing period in days
Net gain: Carcass weight / age at slaughter
Farm names are composed by two-letter country abbreviation and number indicating total finished cattle sold per year. Suffices: K(ilo)= 1,000 animals, T= Top management

Total cost of beef finishing systems

Total cost of beef finishing include all cash cost (expenses), depreciation and opportunity costs. Total costs reflect the long-term relevant cost and allow comparisons between family farms and commercial farms by reflecting the opportunity costs. The *agri benchmark* Result Data Base contains numerous further cost breakdowns as well as return and production indicators, allowing a breakdown of total costs into more than 75 components and providing more than 300 variables.

Figure 4 shows the ranking of 58 beef finishing farms by the total cost in US$ per 100 kg carcass weight sold. The cost differences are enormous, ranging from just around US$ 200 in low-cost farms from Argentina and Brazil to more than US$ 1,000 in Norway. The cost level in the 'high-cost' countries is approximately 2.5 times higher than in the 'low cost' countries. This is a significant difference but it is lower than it was 5 years ago (factor of 3-4 between min and max). The main reason is that cost increases were higher in Argentina and Brazil than in many other countries (see also Figure 6).

Sorting the economic results by the affiliation of the farms to one of the production system mentioned above does not allow drawing conclusions about the economic superiority of specific production systems. It seems to be rather the economic framework conditions like input and factor prices as well as policies and market preferences that determine the return, cost and profitability levels in international comparison. This does not mean that all production systems will lead to the same economic results in each part of the world. It means that certain price relations favour and disfavour certain production systems.

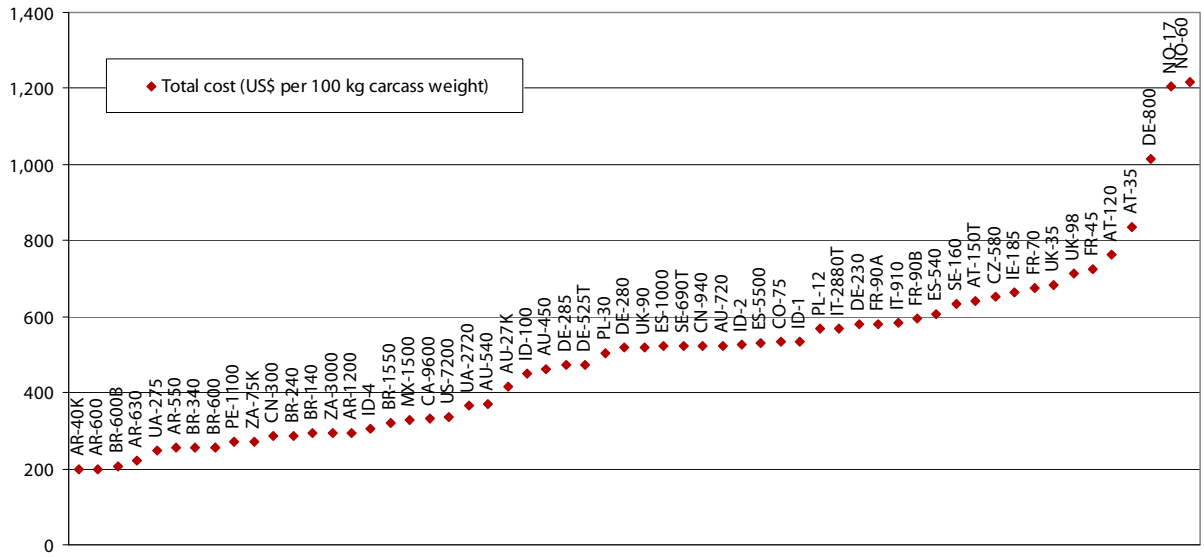

Figure 4: Ranking of total cost in beef finishing (US$ per 100 kg carcass weight)
Farm names: see explanations below Figure 3

Labour productivity

Figure 5 shows the labour productivity of the farms analysed.

The left axis and the blue squares show the **physical** labour productivity, measured in kg beef produced per hour labour input. It reveals that the large feedlot operations in North America, Australia, South Africa but also the feedlot operations in Italy and Spain have the highest labour productivity. At the other end of the range, small (family) farms, sometimes facing difficult natural conditions, are found, for example in Austria, Poland, Norway, China and Indonesia. However, there are larger farms like in the Ukraine and Brazil where labour productivity is relatively low, too.

A low labour physical productivity becomes less relevant the lower the wage levels per hour are. Consequently, the right axis shows the **economic** labour productivity where a) hours worked were first multiplied with the hourly wages, obtaining the total labour cost and b) those were then related to the total returns. The result indicates how much US$ return can be made per US$ total labour cost. Comparing the results for physical and economic productivity, some of the typical farms analysed improve their situation relative to the rest of the farms. These are mainly the farms located in countries with low wage levels such as Poland, Ukraine, Mexico, China and Indonesia. In contrast, farms with high to medium physical labour productivity but high wage levels are on relatively lower economic productivity levels. Examples are farms in Germany, Italy, Spain, USA, Canada and Australia.

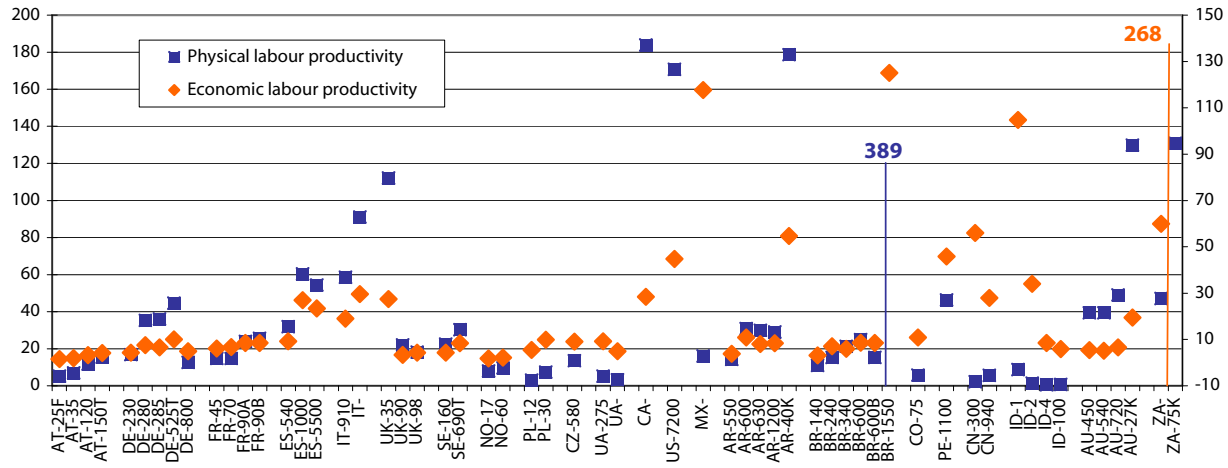

Figure 5: Physical and economic labour productivity
left axis: kg carcass weight beef produced per hour / right axis: US$ return per US$ labour cost
Farm names: see explanations below Figure 3

Cost developments

As Figure 6 shows, cost increases can be observed with feed prices playing a key role (incorporating the impacts of increased energy prices, supply shortage and speculation). Their extent was, however, not as high as the price peaks in 2008 suggest. The reasons are:

— World feed prices had been on the rise for some time in the calendar year 2007 already, with wheat and soybean prices almost doubling and the corn price increasing by 15 percent. These changes were already incorporated in the previous year's results.

— Wheat prices peaked in March 2008, corn prices in June 2008 and soybean prices in July 2008. In the second half of the year the prices fell back to levels of July 2007 and before. The price increases from January 2008 to the peak month were: Soybean +16%, Wheat +15%, corn +45%. This means that in the average of the year 2008 the prices for soybean and wheat fell rather than increased compared to the previous year (all prices from ABARE).

— Some finishing farms reacted with adjustments of their rations to the price increases.

All this means that the overall impact of the record high feed prices in 2008 could be contained and had already started to be seen in 2007. On the other hand, livestock prices increased in most countries, too. Finally, with the exception of the U.S. and some parts of Australia, the US$ beef prices increased from 2008 to 2007 as well, compensating for some of the cost increases.

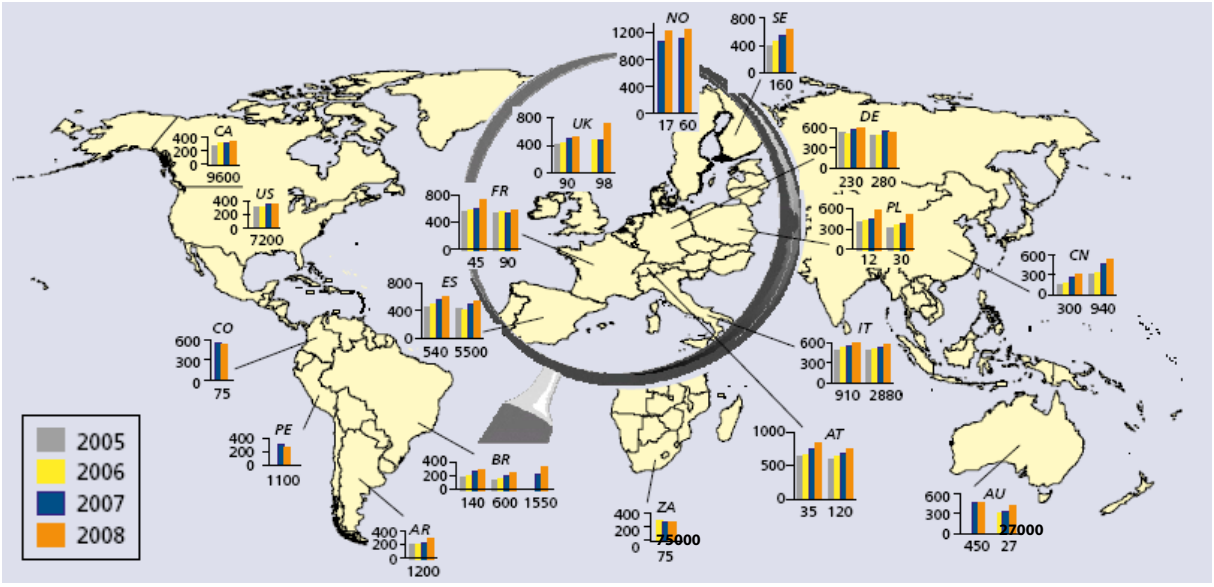

Figure 6: Total cost of beef production for selected farms 2005-2008 (US$ per 100 kg carcass weight)
Note: Results shown for years available in the data set
Numbers on x-Axis indicate different farm sizes (number of animals sold per year)

8 Further development of the Network

The Beef Network is under permanent expansion. Methods and tools are permanently improved. Organisation and management aims at creating products and results which are in demand by the research partners and a wider community. The following paragraphs provide an overview of the expansion path.

- The most important step is the expansion of the beef network towards **meat**. This includes **sheep** for which analysis was commenced in 2009 and first results are available in 2010. Countries presently included are Australia, France, Mexico, South Africa, Spain and the UK. **Pig** analysis is planned to be started in 2010, with first results expected in 2011. For both new products, the experience gained in the Beef Network will be extremely useful.
- There is plenty of discussion and controversy about the role that **livestock emissions** play for climate change. Nevertheless, it seems that there is not enough science available yet to draw conclusions. With its extremely detailed animal and feed data base and results being produced on a per kg output basis, *agri benchmark* provides an opportunity to analyse livestock emissions on a global scale. Emission analysis has begun in 2009 and comprises emissions from enteric fermentation (methane), manure storage and handling (methane and nitrous oxide emissions) and from feed and forage production (CO_2 and nitrous oxide emissions). Extension of the analysis by transport emissions and carbon sequestration from grassland is underway.
- **Merging** of cow-calf and beef finishing enterprises provides detailed cost information from birth to slaughter of the animals. The two relevant cases are **integrated** farms (running both businesses) and **combined** enterprises/farms where weaner calves from one farm are combined with the finishing animals from another farm if breed and weights of the animals are at least very similar. The latter allows cross-region and cross-country analysis of relevant livestock production-chains.
- **Indexing** the annual results more frequently to arrive at semi-annual or quarterly updates of the Result Data Base is presently in a trial phase for selected countries.
- **Supply chain** analysis extends the present view from a farm to a beyond-farm gate perspective. The need of looking at the whole supply chain from production to consumer increases with the level of vertical integration of the supply chain. First steps were done, for example in a beef supply chain analysis in Indonesia. The difficulties of obtaining quantified data down the supply chain might shift the focus of analysis to more qualitative and descriptive fields and/or lead to partnerships with other network type of organisations dedicated to supply chain analysis.
- **Product** development, especially for agribusinesses, **visibility** and **publications** need to be improved.

Finally, *agri benchmark* tries to permanently increase the number of countries and typical farms in the comparison.

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